

Claims

- [c1] 1. A downhole network comprising:
a bottom-hole node interfacing to a bottom-hole assembly located proximate a bottom end of a drill string;
a top-hole node connected proximate a top end of the drill string;
an intermediate node located along the drill string between the bottom-hole node and the top-hole node, the intermediate node configured to receive and transmit data packets transmitted between the bottom-hole node and the top-hole node; and
a communications link, integrated in the drill string, operably connecting the bottom-hole node to the intermediate node, and the intermediate node to the top-hole node
wherein timing of at least two of the nodes is synchronized.
- [c2] 2. The downhole network of claim 1, further comprising a personal computer, operably connected to the top-hole node, for analyzing data received from the intermediate and bottom-hole nodes.
- [c3] 3. The downhole network of claim 2, wherein the per-

sonal computer comprises a user interface to display data received from the intermediate and bottom-hole nodes.

- [c4] 4. The downhole network of claim 1, wherein the bottom hole assembly includes components selected from the group consisting of a pressure sensor, an inclinometer, a temperature sensor, a thermocoupler, an accelerometer, an imaging device, and a seismic device.
- [c5] 5. The downhole network of claim 1, wherein the intermediate node functions as a repeater.
- [c6] 6. The downhole network of claim 1, wherein the intermediate node performs at least one task selected from the group consisting of signal amplification, filtering, error checking, routing, and switching.
- [c7] 7. The downhole network of claim 1, further comprising a module, housing the intermediate node, insertable at a point along the drill string.
- [c8] 8. The downhole network of claim 1, wherein the intermediate node is further configured to gather data from at least one of a downhole sensor and a downhole tool, located along the drill string, proximate the intermediate node.

- [c9] 9. The downhole network of claim 1, wherein at least one of the top-hole node, the intermediate node, and the bottom-hole node is assigned a unique network address.
- [c10] 10. The downhole network of claim 1, wherein the packets include a source address, identifying the source of a packet, and a destination address, identifying the destination of a packet.
- [c11] 11. The downhole network of claim 1, wherein the packets carry data originating from at least one of the group consisting of pressure sensors, inclinometers, temperature sensors, thermocouplers, accelerometers, imaging devices, and seismic devices.
- [c12] 12. A method for transmitting information along a drill string, the method comprising:
transmitting, from a bottom-hole node, a first data packet along a communications link integrated into the drill string;
receiving, by an intermediate node located at an intermediate location along the drill string, and operably connected to the communications link, the first data packet;
amplifying, by the intermediate node, the first data packet; and
forwarding, by the intermediate node, the first data

packet to a top-hole node operably connected to the communications link.

- [c13] 13. The method of claim 13, further comprising receiving, by a personal computer, the first data packet from the top-hole node, for analysis.
- [c14] 14. The method of claim 13, wherein the receiving, by a personal computer, further comprises displaying, on a user interface, data received from the intermediate and bottom-hole nodes.
- [c15] 15. The method of claim 12, further comprising processing, by the intermediate node, the first data packet, wherein processing includes at least one task selected from the group consisting of filtering, error checking, routing, and switching.
- [c16] 16. The method of claim 12, further comprising housing the intermediate node in a module insertable at a point along the drill string.
- [c17] 17. The method of claim 12, wherein at least one of the top-hole node, the intermediate node, and the bottom-hole node is assigned a unique network address.
- [c18] 18. The method of claim 12, further comprising gathering, by the intermediate node, a second data packet

containing data gathered from at least one of a downhole sensor and a downhole tool, located along the drill string, proximate the intermediate node.

[c19] 19. The method of claim 18, wherein the first and second packets include a source address, identifying the source of the packet, and a destination address, identifying the destination of the packet.

[c20] 20. The method of claim 18, wherein the first and second data packets carry data originating from at least one of the group consisting of pressure sensors, inclinometers, temperature sensors, thermocouplers, accelerometers, imaging devices, and seismic devices.